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ABSTRACT

The use of microcomputers as communication aids for physically handicapped children and adults is described. Characteristics of stationary speech output communication aids addressed include encoding by single switch users, an easy to change vocabulary through the use of an "editor," capability to speak via synthesized speech in addition to printing the message, capacity for correcting an entry before the message is produced, efficiency in producing messages, and a "grabber" feature that allows the user to respond quickly to conversation. Modifications in software, hardware, firmware, and keyboards are cited that allow single switch and other nonkeyboard users to operate all keyboard software for the Apple II. (CL)

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The Microcomputer as an Efficient and Versatile Speech-Output Communication Aid

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The microcomputer has been found to be a versatile electronic aid for many physically handicapped children and adults (Rushakoff and Lombardino, in press). One of the applications it has been used for is as a stationary speech output communication aid. Many of the programs created for this purpose are listed in the International Software/Hardware Registry (Vanderheiden and Walstead, 1982).

The purpose of this paper is to describe several key features in versatile communication programs for microcomputers. It is not meant to be a complete list, but to give the clinician, educator, user, and families a model in which to look at communication software.

1) Encoding

Some communication programs are specifically designed for use by single switch users. Others are designed for keyboard users, but can be used by single switch users with a single switch hardware or firmware interface (Tetra Scan II, Express III, Omni, Adaptive Firmware Card, etc). Programs designed for use from the keyboard may increase the speed of message production. Any letter, word, phrase or sentence may be assigned a keyboard letter (Figures 1 and 2). A program designed only for single switch users may be slower in message production speed for individuals able to use the keyboard. (Individuals who have some difficulty using the standard Apple II keyboard may be able to utilize it with a keyguard or with an expanded keyboard.)

2) Easy to change vocabulary

Any communication program should make it very easy to change the vocabulary at any time. Almost all programs allow this through the use of an 'editor.' It is not considered easy to change vocabulary if it is necessary to actually change part of the computer program listing.

3) Can speak and print

The communication program should have the capability of speaking the message through synthesized speech and also printing out the message.

4) Correctable

As with any communication system there should be a way for the user to delete an incorrect entry before the message is produced.

5) Message save feature

Many programs have the ability to save a message that has been created. For example if the user went to a movie it might take him several minutes to create a message about the movie. Without a message save feature it would take him the same amount of time each time he wished to relate the story. With a message save feature he can save his completed message and speak it again with much fewer keystrokes.

6) Message efficiency

Message efficiency relates to the number of key (or switch) presses it takes to produce (speak) a message. Using the following example:

How are you doing today <speak command>

if the program only allowed the message to be created from letters it would take 24 key presses to produce (speak) the message (Count each letter, space and the speak command.)

If the program allowed many common words to be accessed from one letter (encoding, Figure 2) it would take 6 key presses to produce that message. If the program allowed the encoding of many common sentences (Figure 3) it could take only 1 or 2 key presses to speak that message.

7) Grabbers

Part of the problem speechless individuals have in using communication aids is that they are often unable to quickly respond to many of the individuals who pass by during the day. Beyond the clinician, educator, and family, few people will take the time to get involved in a conversation with a speechless person. They are just not always able to provide the quick response that is needed to 'grab' the person who might not otherwise think to take a moment to converse.

Grabbers are a special feature that allow the user to speak a response with one key press. This feature was incorporated in TALK II (Rushakoff, Condon and Lee, 1982). With one key press the individual can speak any pre-determined message up to 100 words long. Some that we have recommend in the past are:

[B] I'm fine...how are you doing today?
[C] Stick it in your ear, dog breath.
[E] It will take me a minute to respond to that.

Single Switch Use of the Apple II

It is now possible for single switch and other non-keyboard users to operate all keyboard software for the Apple II. This can be accomplished in four ways 1) software, 2) firmware, and 3) hardware and 4) keyboard modifications.

1) Software

Some programs allow for the conversion of keyboard software so that it can be used by single switch users (Schwejda, 1982; Rushakoff and Steinberg, 1982.)

2) Firmware

A peripheral card which when plugged into the Apple will allow single switch access to keyboard programs.[1]

3) Hardware

When devices such as the Tetra Scan II[2], Zygo 100[2], Express III[3], and Omni[4] are attached to the Apple II they allow single switch access to all keyboard programs.

4) Keyboard Modifications

There are a couple of devices which can be used for individuals who have some difficulty using the standard Apple II keyboard. Prentke-Romich[2] and TASH[5] manufacture a keyguard for the Apple II. TASH[5] and Cacti Computer Services[6] produce a large, expanded keyboard for the Apple. TASH[5] also manufactures a 'mouth operated keyboard.'

Figure 1: A word page from TALK II before vocabulary was entered.

```
                        PG. 2


A ]                     K ]                     V ]
B ]                     L ]                     W ]
C ]                     M ]                     X ]
D ]                     N ]                     Y ]
E ]                     O ]                     Z ]
F ]                     P ]                     ; ]
G ]                     Q ]                     , ]
H ]                     R ]                     . ]
I ]                     S ]                     / ]
J ]                     U ]                     : ]


>
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Figure 2: TALK II word page after some vocabulary had been entered.

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                        PG.  2


A ]  I                  K ]  AND                V ]
B ]  ME                 L ]                     W ]
C ]  YOU                M ]  KAREN              X ]
D ]  WE                 N ]  STEVE              Y ]
E ]  THEY               O ]  LINDA              Z ]
F ]                     P ]                     ; ] MR. HENRY
G ]  MOM                Q ]                     , ] MRS. PLITT
H ]  DAD                R ]                     . ] MISS BASKIN
I ]                     S ]                     / ]
J ]                     U ]                     : ]

> MOM AND DAD TOOK ME TO THE STORE LAST NIGHT. WE ENDED UP BUYING
  SOME FURNITURE FOR THE LIVING ROOM.
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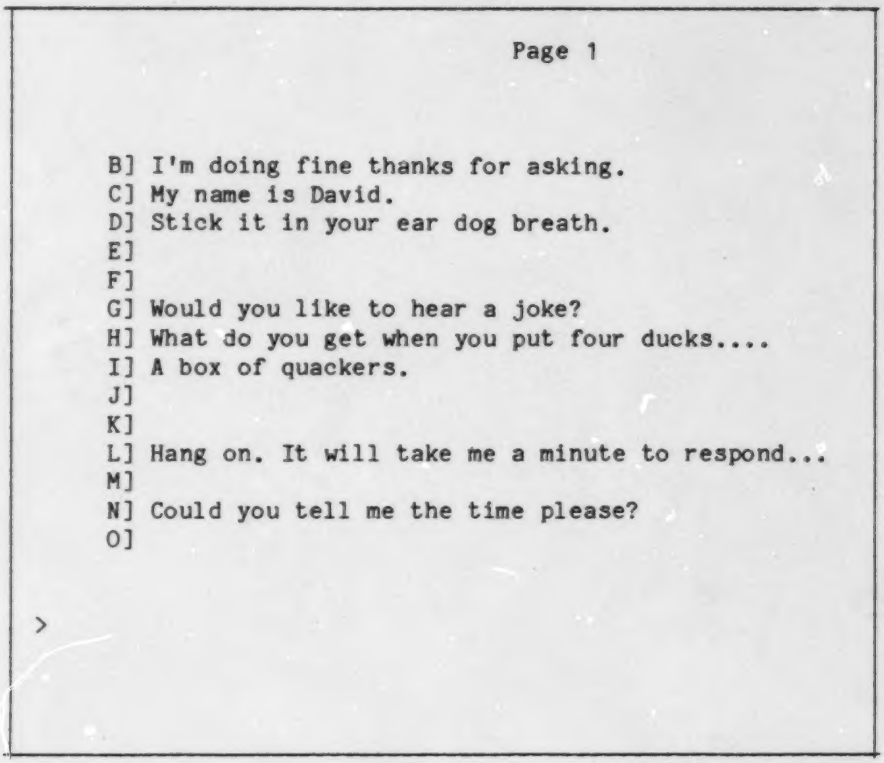
Figure 3: A sentence page from TALK II.
Pressing the letter next to the sentence speaks that message. Each sentence or paragraph can be up to 100 words long.


Page 1
B] I'm doing fine thanks for asking.
C] My name is David.
D] Stick it in your ear dog breath.
E]
F]
G] Would you like to hear a joke?
H] What do you get when you put four ducks....
I] A box of quackers.
J]
K]
L] Hang on. It will take me a minute to respond...
M]
N] Could you tell me the time please?
O]
>

Microcomputer Applications for Handicapped Children

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Vanderheiden, G. and L. Walstead. International Software/Hardware Registry, Madison, WI. Trace Center, 1982.

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Notes

[1]Adaptive Peripherals
4529 Bagley Ave. N.
Seattle, Washington
90103

[2]ZYGO Industries
P.O. Box 1008
Portland, Oregon
97207

[3]Prentke-Romich Co.
8769 Township Road 513
Shreve, Ohio
44676

[4]Communications Research Corp.
1720-130th Ave. N.E.
Bellevue, Washington
98005

[5]Technical Aids and Systems for the Handicapped
2075 Bayview Ave.
Toronto, Ontario
M4N 3M5, Canada

[6]Cacti Computer Services
130 9th St. SW.
Portage la Prairie, Manitoba
R1N 2N4, Canada